Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
SIERRA NEVADA CORPORATION	)	
	)	
Amendment of the Commission's Rules	)	RM - _____________
To Allow for Enhanced Flight Vision System	)	
Radar under Part 87	)	

PETITION OF SIERRA NEVADA CORPORATION FOR RULEMAKING

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EXECUTIVE SUMMARY

Sierra Nevada Corporation ("SNC") has spent nearly a decade developing an Enhanced Flight Vision System ("EFVS") for use in both fixed and rotary-wing aircraft. The EFVS supplements instrument landing systems and pilot vision during approach operations by providing a visual image of terrain and obstacles on or near the runway. The image is created using several technologies and sensors, including a radar transmitter that operates in the 92.5-95.5 GHz frequency range. SNC is initiating this proceeding to obtain authority for use of the radar, which is the only RF technology in the system.

EFVS is used to enhance visibility by pilots in degraded visual environments ("DVEs") caused by dust, sand, snow, rain, fog, and smoke, whether naturally occurring or manmade. SNC's EFVS allows pilots to "see" through obscurant conditions when natural eyesight cannot. The technology will increase the opportunities for flights to land in conditions that would otherwise close airports or delay landings. EFVS will provide a great public benefit by decreasing the number of flight delays and aborted or delayed landings due to low visibility conditions.

Federal Aviation Administration ("FAA") regulations provide that pilots may use EFVS to enhance situational awareness during approach and, under certain circumstances, during landings. The FAA has adopted EFVS as an acceptable means of approach operations, one that can be relied upon to obtain airworthiness certification for enhanced and synthetic vision technologies on aircraft. The FAA also has identified millimeter wave radar as one type of real-time imaging sensor that may be used for EFVS.

Radars operating in 90 GHz provide for optimal resolution and obscurant penetration. SNC seeks to modify the Federal Communications Commission's ("FCC," or the "Commission") Part 87 Aviation Service rules to provide for EFVS radar operations. The Commission's Aircraft Station rules in Part 87 provide for "communications to the necessary safe, efficient, and economic operation of aircraft," to include various airborne radars used for aeronautical radionavigation. Presently, there are no rules allowing for EFVS radar and no service rules for any Aircraft Station operations above 33 GHz. Revision of the Commission's rules to allow for EFVS in 90 GHz will open an underused frequency range to a service that is very much in the public interest.

Proposed revisions to the Commission's rules are set forth in **Appendix A** attached hereto. SNC proposes the following rule changes:

Rule Section	**Title**	**Description**
§ 2.106	Table of Frequency Allocations	Adds Part 87 Radio Navigation to the Table
§ 87.5	Definitions	Adds a definition of EFVS
§ 87.107(d)	Station Identification	Adds EFVS to the list of exempted stations
§ 87.173	Frequencies	Adds 92-95.5 GHz to the list of assignable frequencies
§ 87.187	Frequencies	Adds subsection (ii) to include 92-95.5 GHz to the list of frequencies allowed for use by Aircraft Stations

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PETITION OF SIERRA NEVADA CORPORATION
FOR RULEMAKING

Pursuant to Section 1.401(a) of the Federal Communications Commission's ("FCC" or the "Commission") rules,[1] Sierra Nevada Corporation ("SNC") hereby requests that the FCC initiate a rulemaking proceeding to modify its rules to allow for the operation of Enhanced Flight Vision System ("EFVS") radar in the 92-95.5 GHz frequency range. Amending the rules pursuant to SNC's proposal will provide for a new technology that will better support aircraft landings in degraded visual environments (fog, rain, dust, haze, and sand). This will improve airport access and reduce weather-related aircraft delays, providing for better airplane fuel economy and reduced operating costs.

I. INTRODUCTION

Sierra Nevada Corporation, established in 1963 and headquartered in Sparks, Nevada, is a privately owned and operated company focused on aerospace, aviation, system integration, and electronics. SNC has numerous fielded systems operating throughout the world by both private

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[1] 47 C.F.R. § 1.401(a). The Commission has legal authority to commence a rulemaking proceeding of this nature under various sections of the Communications Act of 1934, as amended. *See* 47 U.S.C. §§ 4(i), 7(a), 302 (a), and 303.

and public entities, and has won the contract to develop the Dream Chaser spaceplane that will deliver cargo to the International Space Station.

The genesis of SNC's EFVS system comes from employees returning from military theaters in Iran and Afghanistan who observed the dangers of landing military aircraft during "brownouts" and other low visibility conditions, especially sand storms. The U.S. military has lost hundreds of lives and billions of dollars in aircraft and equipment over the past decade due to accidents caused by aircraft operating in these Degraded Visual Environments ("DVEs").[2] While there are already EFVS technologies available, these systems are based on infrared camera sensors, which have proven to be inadequate because the infrared wavelengths are near the visible spectrum. Previous reliance on infrared camera systems created the same constraints as a pilot's natural vision, meaning limited penetration through heavily degraded visual conditions.[3] Adding radar, operating in the millimeter wave spectrum, to EFVS allows pilots to "see" through heavily degraded visual conditions. Presently, there are no commercial solutions that can accomplish this.

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2 *See* Anne Wainscott-Sargent, *Enhanced Vision Systems*, Avionics Magazine (Oct./Nov. 2017) (noting that since 2002, 44% of aviation fatalities in Iraq and Afghanistan, and approximately 25% of military aircraft crashes, were the result of degraded visual environments); David Weese, *The Degraded Visual Environment (DVE)*, Army Aviation Magazine (Oct. 25, 2016), http://www.armyaviationmagazine.com/index.php/archive/not-so-current/1200-the-degraded-visual-environment-dve ("DVEs are a primary contributing factor in Army Aviation accidents, accounting for approximately a quarter of the Class A/B flight accidents and over 80% of the fatalities from 2002-2015. The materiel cost alone is estimated in excess of $1 billion.").

3 *See* Federal Aviation Administration, *Revisions to Operational Requirements for the Use of Enhanced Flight Vision Systems (EFVS) and to Pilot Compartment View Requirements for Vision Systems*, Notice of Proposed Rulemaking, 78 Fed. Reg. 34935, 34948 (June 11, 2013) ("*EFVS NPRM*") ("While IR-based sensors provide the required enhanced flight visibility in certain visibility-limiting conditions, they currently do not provide the enhanced flight visibility required by the operating rules for EFVS to support operations in lower visibility ranges. *Industry is developing other sensor technologies, such as millimeter wave radar, that are not limited in the same ways that IR-based sensors are limited.*") (emphasis added).

One long-standing issue for cargo carriers and airlines is weather-related delays and cancellations. Certain airports in particular, such as San Francisco International Airport ("SFO"), are well known for certain types of weather delays. In the case of SFO, on-time arrivals and departures occur only around 75% of the time, with most delays lasting at least one hour, largely due to low visibility conditions created by fog.[4] According to the FAA, weather-related delays occurring at airports operating very near capacity "means that delayed flights may have to wait hours to land or depart."[5] Diversions to other airports, taxi-backs to gate after push-off, and airborne holding events are other consequences demonstrating that "over-crowded airspace and low fuel conditions can become serious issues."[6] Allowing for the use of 90 GHz radar for improved EFVS will allow for more landings in challenging conditions, which will be a great public benefit.[7]

II. DISCUSSION

The FCC's rules do not provide for the operation of any radar system that can be used on an aircraft for EFVS. For this reason, SNC requests that the FCC begin a rulemaking proceeding to allocate the 90 GHz band for Part 87 operations of EFVS radar. Adoption of SNC's proposed rules will provide great public benefits, including more efficient flight and airport operations as well as reduced use of aircraft fuel.

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[4] Divya Raghavan, *Why Flights at SFO Are Usually Delayed, and Why It Will Get Worse This Summer*, NERDWALLET (May 12, 2014), https://www.nerdwallet.com/blog/studies/sfo-airport-delay/.

[5] *See FAQ Weather Delay*, FEDERAL AVIATION ADMINISTRATION https://www.faa.gov/nextgen/programs/weather/faq/ (last visited Dec. 11, 2017).

[6] *Id.*

[7] One estimate is that the combined cost of cancelled and delayed commercial flights to consumers and carriers amounts to nearly $1500 per minute. *See* Matthew J. Belvedere & Phil Lebeau, *Weather flight disruptions cost $1.4 billion: Data*, CNBC (Jan. 8, 2014, 8:56 AM), https://www.cnbc.com/2014/01/08/weather-flight-disruptions-cost-14-billion-data.html.

A. EFVS Technology and the Need for 90 GHz Radar

SNC's EFVS generates terrain and obstacle imagery to supplement instrument landing systems and a pilot's natural vision during an aircraft's final approach and landing in DVEs. The EFVS provides a synthetic vision, or computer generated image of the terrain and obstacles, which a pilot views on an aircraft's head-up display ("HUD") or equivalent display. It is intended for use only during poor visibility situations, pursuant to FAA rules.

The primary sensor on SNC's system is a 90 GHz millimeter wave radar. The radar scans a "pencil beam" transmission across the field of view ahead of the aircraft, generating position information regarding the range, azimuth, and elevation position of the terrain and any obstacles within the field of view.[8] The system also, optionally, may contain light detecting and ranging ("LIDAR") sensors and long-wave infrared cameras. The radar sensor unit operates in the radio frequency spectrum and, for this reason, requires FCC authorization for its operation.

The 90 GHz frequency range was chosen for several reasons. From a physical perspective, 90 GHz is the optimal frequency range to maximize obscurant penetration and radar angular resolution. An EFVS requires a "real-time imaging sensor providing demonstrated vision performance in low visibility conditions," allowing "the required visual references to become visible in the image before they are visible naturally out-the-window."[9] 90 GHz radar provides for the best overall technological solution for deep penetration with moderate resolution in nearly all visual obscurants. Other frequency ranges are less optimal. For example, a lower frequency range

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[8] The SNC radar generates transmit pulses using BPSK modulation of the carrier frequency, adjustable in 60 MHz steps from 92.5-95.5 GHz. Each scan of the field of view is accomplished in approximately 10-30 milliseconds.

[9] Federal Aviation Administration, *Airworthiness Approval of Enhanced Vision System, Synthetic Vision System, Combined Vision System, and Enhanced Flight Vision System Equipment*, Advisory Circular 20-167A, at 2.4.2 (Dec. 6, 2016) ("AC 20-167A").

often used by traditional radar systems (*e.g.*, the X-band, approximately 10 GHz) allows for very deep penetration, but resolution would be an order of magnitude worse, and could not be used to resolve runways and other objects at required ranges. The Ka band (approximately 35 GHz) provides 2.7 times poorer resolution for the same size antenna. Lower millimeter wave frequency ranges would require much larger antennas (*e.g.*, three times the size at 35 GHz), which would be impractical or impossible to mount on the cone of an aircraft. Beyond 100 GHz, there is more than twice the atmospheric attenuation, providing poorer DVEs penetration. Additionally, technologies that operate in the IR wavelengths (*e.g.*, LIDAR and cameras) provide only a small improvement to the pilot's natural vision.

The FAA's definition of Enhanced Flight Vision System specifies millimeter wave radar as one type of real-time imaging technology that can be used for EFVS.[10] As the FAA has explained, "[o]ne advantage of millimeter wave radar systems is their general immunity to weather obscurations."[11] Further, "[t]he quality of the enhanced vision image and the level of enhanced vision sensor performance depend on the atmospheric and external visible and non-visible energy source conditions."[12]

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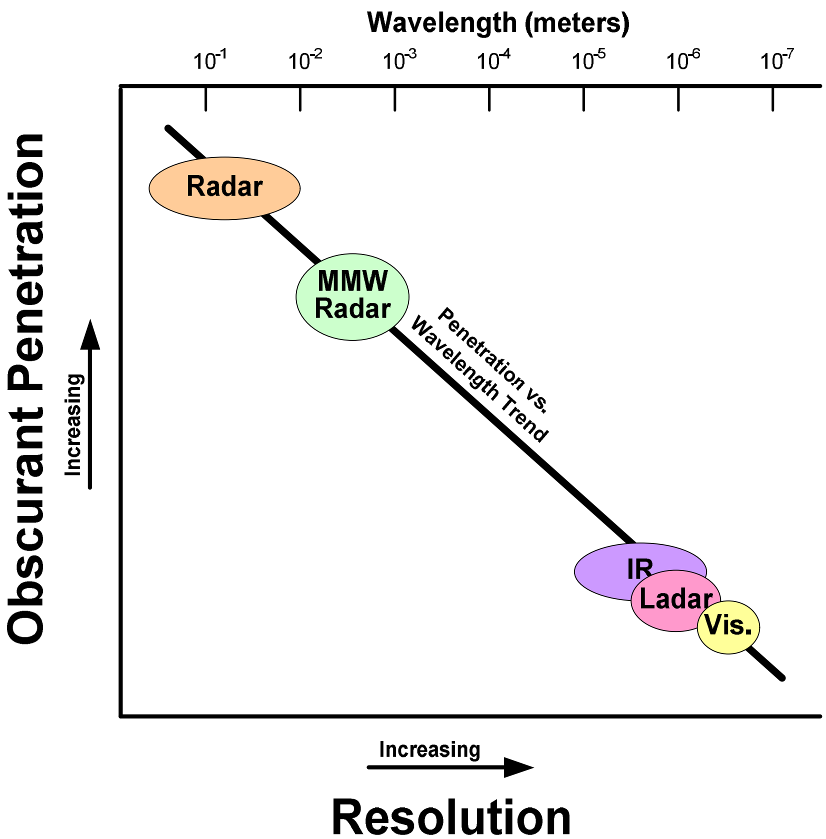
[10] 14 C.F.R. § 1.1 (Defines EFVS as "an installed aircraft system which uses an electronic means to provide a display of the forward external scene topography (the natural or manmade features of a place or region especially in a way to show their relative positions and elevation) through the use of imaging sensors, including but not limited to forward-looking infrared, millimeter wave radiometry, *millimeter wave radar*, or low-light level image intensification. An EFVS includes the display element, sensors, computers and power supplies, indications, and controls.") (emphasis added).

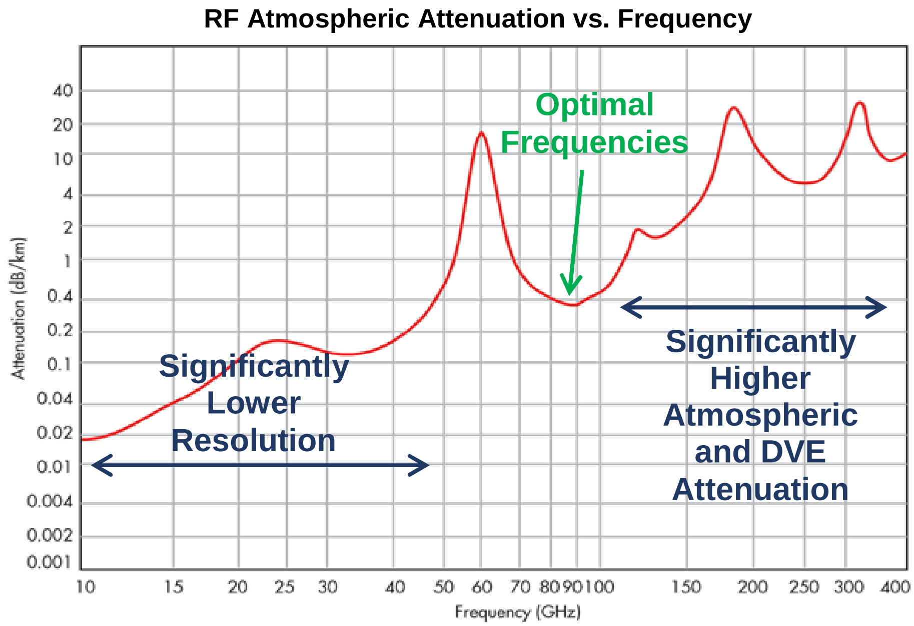
[11] AC 20-167A at 2.1.2.2.

[12] AC 20-167A at 2.1.2.3.

The following graphic illustrates the trend line between resolution, and the ability to see through obscurants:



Establishing EFVS operations in the 90 GHz band provides for good DVE penetration for short range radar applications such as this. It also allows for manufacturing a sensor package (which includes the radar) in a size that can fit in and around the nose of most aircraft.



There are also practical reasons to use 90 GHz for EFVS radar. Commercial production of chipsets and key components suitable for high resolution imaging radars[13] has coalesced around the 92-96 GHz range, generally placing the components' center frequency at 94 GHz. For this reason, the SNC radar, like others, is designed with a center frequency of 94 GHz, which creates an operational frequency range different from the traditionally recognized frequency bands (*i.e.*, 92.5-95.5 GHz). To the best of SNC's knowledge, there are no standard ("off the shelf") chipsets and components suitable for narrowband, high resolution imaging radars that are produced for operations below 92 GHz or above 96 GHz.[14]

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13 Key components include narrowband power amplifiers (for transmitters) and low noise amplifiers (for receivers).

14 There are no commercial chipsets and other components for use above 100 GHz suitable for most uses. *See* Federal Communications Commission, Technology Advisory Council, *Spectrum Frontier Working Group Presentation*, at 13, slide 66 (Dec. 9, 2013) ("TAC Presentation"), https://transition.fcc.gov/bureaus/oet/tac/tacdocs/meeting12913/TAC-Presentation-12-9-13.pdf (finding that the technology and demand cycle are not mature for commercial technologies above 95 GHz.).

B. The FAA's Regulation of EFVS

The FAA is responsible for aviation safety, including the certification of aircraft, and aircraft and airport safety.[15] According to the FAA, "[w]hen the destination airport weather is forecast or reported to be below authorized minimums at the estimated time of arrival, [there are] certain dispatch, flight release, and IFR takeoff limitations as well as limitations related to initiating an approach, continuing an approach beyond the final approach fix (FAF), or beginning the final approach segment of an instrument approach procedure."[16] For this reason, the agency recently has focused on developing new rules and guidance for EFVS.

In December 2016, the FAA published a final guidance for EFVS airworthiness approvals, which also addressed operational aspects of EFVS.[17] In March 2017, the FAA issued an Advisory Circular that provided guidance for EFVS approach operations.[18] That Advisory Circular addressed: (1) aircraft eligibility to conduct EFVS operations; (2) operational rules for use of EFVS; (3) pilot training requirements; and (4) how EFVS can be used under DVEs conditions.[19] The FAA has modified its rules to incorporate these new policies.[20]

EFVS must obtain FAA type design approval prior to use.[21] Airworthiness approval for an EFVS may be obtained as either: (1) an *EFVS Approach System* – EFVS may be used upon

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15 49 U.S.C. § 106(g).

16 *EFVS NPRM*, 78 Fed. Reg. at 34936.

17 AC 20-167A.

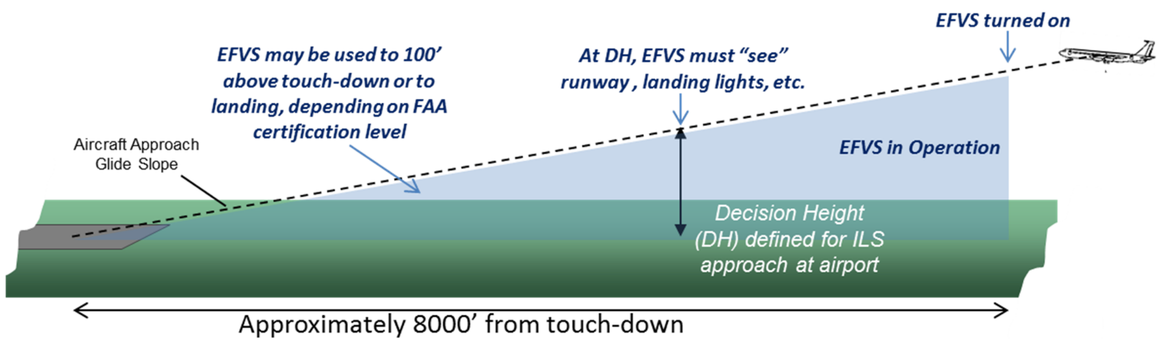
18 Federal Aviation Administration, *Enhanced Flight Vision Systems*, Advisory Circular 90-106A (Mar. 2, 2017) ("AC 90-160A").

19 *Id*.

20 *See* 14 C.F.R. § 95.175 (covering requirements for takeoff and landing under instrument flight rules).

21 *See EFVS NPRM*, 78 Fed. Reg. at 34938; AC 90-106A at 4.1.1.1. Foreign registered aircraft flying in the U.S. must meet slightly different rules. *Id*. The Radio Technical Commission

approach to a landing, but only until 100 feet above the touchdown zone; or (2) an *EFVS Landing System* – EFVS may be used for both approach and landing.[22] In general, for fixed-wing aircraft, a pilot uses an instrument approach until an aircraft reaches Decision Altitude or Decision Height ("DA/DH"),[23] *i.e.*, altitude levels that vary by airport, but generally are a few hundred feet above touchdown point, after which natural vision may be used.[24] The FAA's guidelines determine when EFVS may be used in lieu of natural vision.[25] Thus, by its defined use, EFVS is a low altitude, short-range system. The FAA does not allow EFVS to be used to fly an aircraft down to DA/DH, and pilots also should not rely on it during ground operations once an aircraft has landed.[26] The following diagram illustrates typical operations:



for Aeronautics ("RTCA") develops Minimum Aviation Performance Standards ("MAPS") for EVFS technology.

22 AC 20-167A at 2.4.3.

23 In some situations, the terms MDA/MDH apply.

24 *See* AC 20-167A at 4.5.1.9 (explaining that on a "3 degree glide slope, the horizontal distance from the aircraft to the runway threshold is approximately 2816 feet," which is approximately 3816 feet from the precision touchdown zone markers).

25 The revised rules now allow for continued use of EFVS until touchdown under limited circumstances. *See* AC 90-106A at 4.1.3.

26 *See* AC 20-167A at 3.2.2, note 1, and 4.1.6.2.1, note (using video imagery on the HUD or equivalent display should not be considered "if sensor proximity to the taxiway surface causes a distraction").

For rotorcraft, the FAA has not yet defined operational conditions. However, given the short range of operation, the EFVS in rotorcraft likely would be used no more than 1000 feet from the ground for a duration of approximately 30-60 seconds.

SNC's proposal provides that the FCC permit the operation of 90 GHz radar for EFVS use, leaving to the FAA's authority the determination of when and how EFVS may be used.

C. Proposed New Rules

SNC proposes that the FCC modify Subpart F of Part 87 of the Commission's rules, which governs Aircraft Stations, to allow for EFVS radar operations. Subpart F regulates radio equipment that is located onboard aircraft. Like other aircraft stations, the EFVS radar would operate under an operator's aircraft station license. EFVS would be used with the aircraft's flight navigation information to create images used to detect the runway and other objects through DVE obscurants.

Specific rule changes are set out in **Appendix A** attached hereto. SNC proposes that:

- The Commission modify Section 87.5 to add the following definition for EFVS radar: "Enhanced flight vision system is an aircraft station using radar and other technologies to provide a real-time enhanced image of the terrain and obstacles to the pilot."
- That Section 87.107(d) be amended to add EFVS radar to the list of stations exempted from station identification requirements.
- That Section 87.173, the table of frequencies for the service, be modified to include the frequency 92-95.5 GHz under Subpart F (Aircraft Stations) for the "MA" class of stations for aeronautical radionavigation.
- That subpart (ii) be added to Section 87.187 in order to provide for use of airborne radars for EFVS in 92-95.5 GHz.

SNC expects that Section 87.147, which provides for authorization of equipment, will apply, and that both the FCC and FAA will evaluate any proposed EFVS radar on a case-by-case basis.[27] This will allow for technical neutrality and flexibility in the FCC's new rules for EFVS radar.

In addition, SNC requests that the Commission modify Section 2.106 to allow for the aforementioned changes.

D. <u>Adoption of Rules for EFVS Radar is in the Public Interest</u>

The FAA has determined that enhanced EFVS "should increase access, efficiency, and throughput at many airports when low visibility is a factor."[28] Presently, "[i]nterrupted flight operations due to low visibility result[s] in lost passenger time and extra fuel consumption."[29] One benefit of EFVS is providing "access to more runways when visibility is low, leading to increased throughput and reduced delay."[30] EFVS will "[s]ave time, fuel and emissions while allowing for the potential to limit overflight of environmentally sensitive areas."[31]

Radar-based EFVS technology in particular will provide these benefits to the public. It will allow for better aircraft access to airports – particularly at U.S. airports that are often susceptible to foggy or rainy conditions. This will result in fewer redirected or delayed flights, which improves airport efficiencies and reduces aircraft operational costs.[32] It also provides for better fuel

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27 47 C.F.R. § 87.147.

28 Federal Aviation Administration, *Revisions to Operational Requirements for the Use of Enhanced Flight Vision Systems (EFVS) and to Pilot Compartment View Requirements for Vision Systems*, Final Rule, 81 Fed. Reg. 90126 (Dec. 13, 2016).

29 *EFVS NPRM*, 78 Fed. Reg. at 34949.

30 Federal Aviation Administration, *NextGen Implementation Plan 2016*, at 39 (2016), *available at* https://www.faa.gov/nextgen/media/NextGen_Implementation_Plan-2016.pdf.

31 *Id.*

32 *Id.*

efficiency for aircraft as it can reduce the amount of flight time that an aircraft spends in a holding pattern waiting for visibility conditions to improve. This saves on costs, and also reduces the environment impact of flights by reducing emissions. Current infrared-based technologies are inadequate to support landings in heavily degraded visual conditions that create these situations.

Adoption of these rules also will support the goals of the FAA's NextGen Implementation Plan ("NextGen"). The NextGen plan is focused on the improvement of approaches and landings, as well as other flight operations.[33] Elimination of airport ground infrastructure used for landings and approaches – which has been costly to both deploy and maintain – will open airports that are presently limited because they do not have certain ground systems. EFVS is aircraft-derived, and requires no ground system infrastructure, supporting these NextGen goals.

For these reasons, it is in the public interest for the Commission to commence a rulemaking proceeding to open the 90 GHz band for EFVS radar.

E. <u>Coexistence with Other Users</u>

The spectrum characteristics of the 90 GHz frequency range facilitate the Commission allowing sharing among multiple users. As the Commission has determined, RF signals in millimeter wave frequencies "suffer from severe propagation losses."[34] Particularly in the 92 GHz frequency range, the Commission has noted that "a 0.65 kilometer path at 92 GHz produces the

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33 Federal Aviation Administration, *NextGen Implementation Plan 2016*, at 38-41 (2016), *available at* https://www.faa.gov/nextgen/media/NextGen_Implementation_Plan-2016.pdf.

34 *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, GN Docket No. 14-177, Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order, FCC 17-152, ¶ 85 (rel. Nov. 22, 2017) (referring to 64-71 GHz).

same loss as a 10 kilometer path at 6 GHz, namely, 128 dB."[35] This facilitates shared spectrum use of the band – transmission interference is more localized due to the atmospheric attenuation.

In particular, the potential for harmful interference to other receivers from an EFVS radar will be extremely minimal due to the low power, low altitude, short duration, and low duty cycle of EFVS radar operations. These factors will serve to allow spectrum sharing between EFVS radar and other users.

At present, there are very few users of 90 GHz. Most of 92-95 GHz is allocated to non-Federal and Federal users on a co-primary basis, though 94-94.1 GHz is allocated to Federal use on a primary basis.[36] The non-Federal allocations are for Part 101 (Fixed Services) and Part 15 (indoor unlicensed).[37]

While some Fixed Service ("FS") links have been coordinated, no commercial equipment appears to be available.[38] In the event that equipment becomes available, the likelihood of harmful interference from an EFVS radar into a microwave link would be exceedingly low.[39] If necessary,

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35 *Allocation and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands*, Report and Order, 18 FCC Rcd. 23318, 23338 (2003). These characteristics allow for systems to be "engineered in close proximity to other systems." *Id*.

36 47 C.F.R. § 2.106.

37 *Id*.

38 A search of the FCC's equipment authorization database, conducted on January 18, 2018, indicated that only one grant of certification has been issued for the 90 GHz band, for a Part 15 device.

39 As noted, EFVS would only be used in the event of adverse weather conditions and at defined locations (near airports). Moreover, FS antennas are very high gain, meaning they are set in very targeted and precise directions, and are intended to be set horizontally, while EFVS radars will be directed along a 3% grade on fast-moving aircraft. It would be a rare occurrence where EFVS is turned on and used on an aircraft glide path where the EFVS radar beams directly into an FS antenna, and for a duration long enough that a link would be taken down.

specific spectrum sharing arrangements can be discussed, such as registering flight landing patterns in fixed services spectrum management databases.

Part 15 users operate subject to the conditions that they must not cause harmful interference to, and must accept harmful interference from, other authorized users.[40] Additionally, in this band, Part 15 users are limited to indoor operations, and the signals must not be intentionally directed outside of a building.[41] They also are not permitted on aircraft or satellites.[42] As noted, only one Part 15 certification has been granted for this frequency range, for a radar level tank gauge. The existence of a minimal number of Part 15 devices operating in this band, with no outdoor or on aircraft use allowed, assures that EFVS radar will not disrupt the installed base of unlicensed devices.

In terms of Federal use, the 92-100 GHz range is allocated for fixed, mobile, radio astronomy (RAS), earth exploration satellite service (EESS), and various radar uses.[43] SNC recognizes that footnote US342 applies to most of these bands, and provides that "all practical steps shall be taken to protect the radio astronomy service from harmful interference."[44] EESS and space research operations are limited to CloudSat, which projects a relatively small beam footprint with a very low probability of intersection with the EFVS transmissions.[45] SNC is confident that successful spectrum sharing can occur.

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40 47 C.F.R. § 15.5.

41 47 C.F.R. § 15.257(a).

42 47 C.F.R. § 15.257(b).

43 47 C.F.R. § 2.106.

44 47 C.F.R. § 2.106 n.US342. RAS is used at three locations in the country: Kitt Peak, Owen Valley, and weather permitting, Green Bank.

45 47 C.F.R. § 2.106 n.5.562.

Finally, to co-exist with other Federal users, SNC suggests that any FCC certified EFVS radar meet the same technical standards as federal radars, in particular the Radar Spectrum Engineering Criteria ("RSEC") standards set out in Chapter 5 of the NTIA's Redbook.[46] These standards were adopted to ensure that multiple users may share the same spectrum range.

III. CONCLUSION

The next generation of Enhanced Flight Vision Systems will benefit Americans by allowing for more landings during degraded visual environments, making flights more reliable and timely. Millimeter wave radar is a key component of EFVS, and its use is necessary to achieve sufficient imaging for pilots using EFVS to land.

The 90 GHz band is uniquely well suited for these radar systems. It is time for the Commission to commence a rulemaking proceeding to put in place rules to allow for 90 GHz EFVS radar, allowing for commercialization of these systems. Accordingly, SNC respectfully requests that the Commission issue a notice of proposed rulemaking proposing to adopt rules in accordance with those set out in **Appendix A**.

Respectfully submitted,

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[46] 47 C.F.R. § 300.1.

APPENDIX A

Proposed Revisions to the Commission's Rules

Chapter 1 of Title 47 of the Code of Federal Regulations is proposed to be amended as follows:

Part 2 – FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS: GENERAL RULES AND REGULATIONS

1) Section 2.106, the Table of Frequency Allocations, is amended as follows:

§ 2.106 Table of Frequency Allocations

FEDERAL TABLE	NON-FEDERAL TABLE	FCC RULE PART(S)
92-94 GHz FIXED MOBILE RAIO ASTRONOMY RADIO LOCATION US161 US342	RADIONAVIGATION	RF Devices (15) Fixed Microwave (101) Aviation (87)
94-94.1 GHz EARTH EXPLORATION SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) Radio astronomy 5.562 5.562A	**94-94.1** RADIOLOCATION RADIONAVIGATION Radio astronomy 5.562A	RF Devices (15) Aviation (87)
94.1-95 GHz FIXED MOBILE RADIO ASTRONOMY RADIO LOCATION US161 US342	RADIONAVIGATION	RF Devices (15) Fixed Microwave (101) Aviation (87)
95-100 GHz FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION RADIONAVIGATION RADIONAVIGATION SATELLITE 5.554 US342		Aviation (87)

Part 87 – AVIATION SERVICES

2) Section 87.5 is amended by adding the definition of Enhanced Flight Vision System to read as follows:

§ 87.5 Definitions

***

Enhanced Flight Vision System: Enhanced flight vision system is an aircraft station using radar and other technologies to provide a real-time enhanced image of the terrain and obstacles to the pilot.

*****

3) Section 87.107 is amended by adding enhanced flight vision systems to the list of exempted stations.

§ 87.107 Station identification

***

(d) *Exempted station*. The following types of stations are exempted from the use of a call sign: Airborne weather radar, radio altimeter, air traffic control transponder, distance measuring equipment, collision avoidance equipment, racon, radio relay radio-navigation land test station (MTF), automatically controlled aeronautical enroute stations, and enhanced flight vision systems.

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4) Section 87.173 is amended by adding the frequency range 92-95.5 GHz to the list of assignable frequency bands:

§ 87.173 Frequencies

***

(b) Frequency table:

Frequency or frequency band	Subpart	Class of station	Remarks
*** 92000-95500 MHz	F	MA	Aeronautical radionavigation

*****
5)	Section 87.187 is amended to add the frequency 92-95.5 GHz to the list of frequencies used by aircraft stations, as follows.

§ 87.187 Frequencies

***

(ii) The frequency band 92-95.5 GHz is available for use by air carrier and private aircraft stations for aeronautical radionavigation (EFVS airborne radars).

*****